

SOLAR ROCKS: CONCENTRATION AND STORAGE OF SOLAR ENERGY IN MINING FACILITIES



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PROBLEM

Mining facilities have a limited lifespan. Afterwards, reclamation costs millions of dollars and the abandoned mines present a huge environmental issue. Additionally, clean energy sustainability is a crucial problem of the present generation. Finding a solution to address both concerns would be fantastic.

PROJECT GOAL

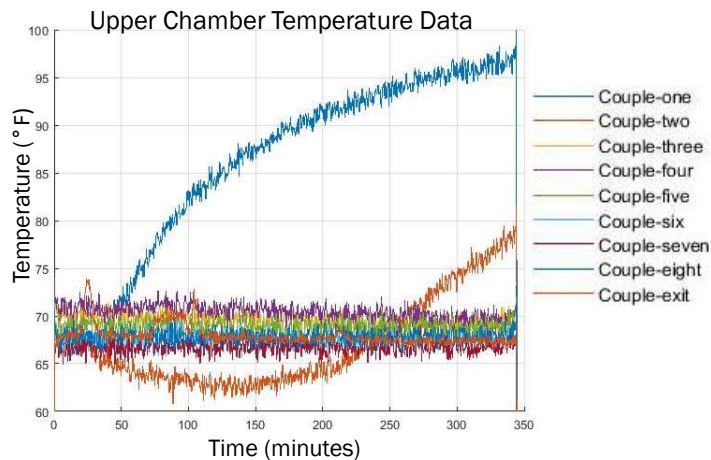
Using abandoned mines as thermal energy storage is an innovative solution for addressing major problems. The goal is to test the feasibility of converting mines into thermal energy storage for solar energy by developing a testing apparatus to mimic the waste rock, overburden, and tailings from mines.

PROJECT DELIVERABLE

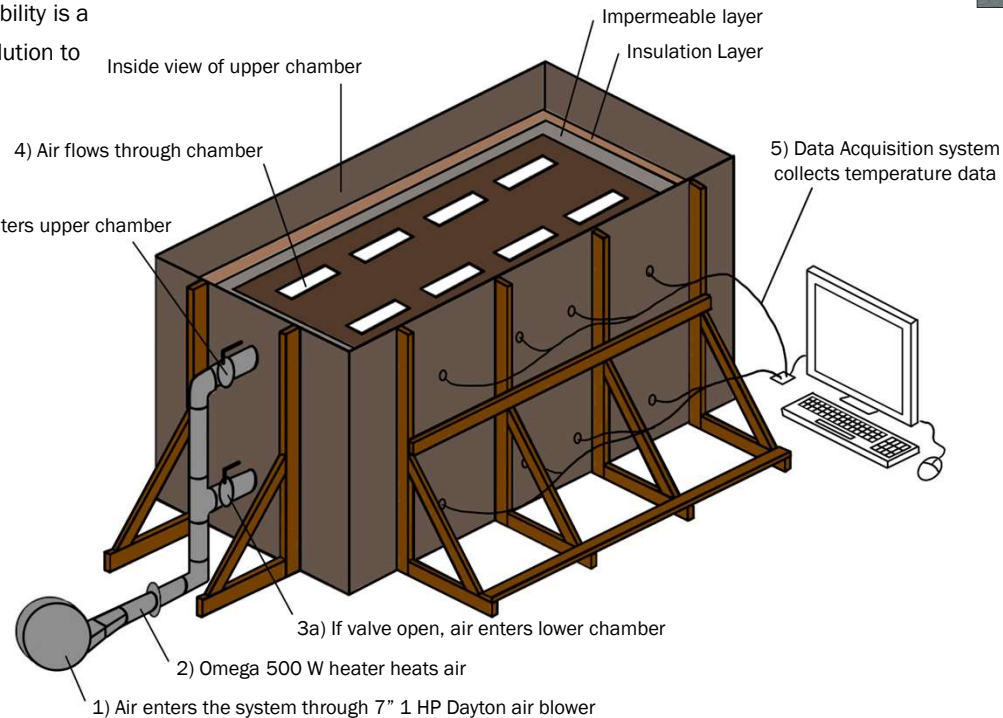
- A chamber to store ~20,000 lbs. gravel
- To pump hot air into chamber at temperatures up to 300 °F
- To measure temperature in the 8 different locations in the test chamber with 1.5 °F accuracy

RESULTS

Temperature data in the upper chamber shown in graph to the right. Thermocouples 1 and 2 exhibited significant temperature changes, while other thermocouples remained constant.



DESIGN



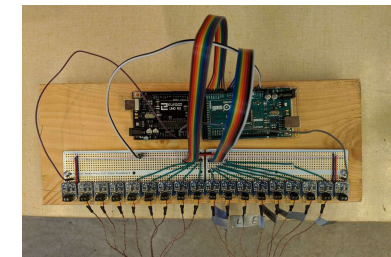
EXPERIMENT SETUP



View of the upper chamber. Bricks create paths for air to flow.

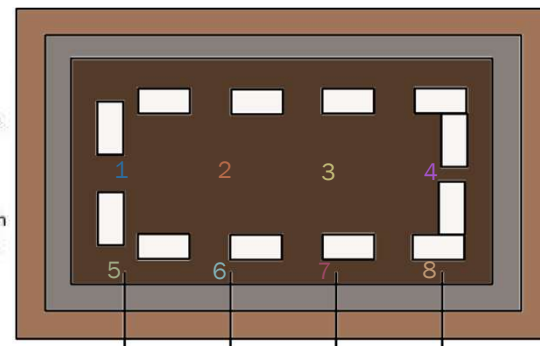


Full system in operation



Data Acquisition System measures temperature with K-type thermocouples, amplifiers, and Arduinos

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Location of thermocouples within the upper chamber. The colors correspond to graph on left.